affected by sanitation; bacteriology; the effect of filth, impure drinking water and foul air on health; water supply, storage and filtration; construction of reservoirs and supply of water to towns; sewerage, both for cities and houses; and the disposal of garbage and town refuse. In the introductory chapter the elements of sanitary science which are essential to sanitary engineering are briefly outlined, and in the historical notes it is shown how the filthy habits of the people in early times led to direful epidemics of plague. It is pointed out that "the teachings and practice of the Christian Church during the Middle Ages regarded cleanliness as one of the luxuries which was inconsistent with godliness, while bodily filth was considered as a work of inward piety and holy sanctification. The example set by the monastic orders was imitated by the people at large; bathing was unknown, houses and clothing were filthy, and the streets served as receptacles for garbage and human excreta." Some interesting statistics are given to show how the death rate has decreased as sanitary science has advanced. The annual death rate of the population of London in the latter half of the seventeenth century was nearly 80 per thousand; in the eighteenth century, about 50 per thousand; and soon after the middle of the nineteenth century, about 24 per thousand; and now ranges about 20·5 per thousand. An efficient system of sewerage and water supply has been known to reduce the death rate in large towns in England and the continent from typhoid, from a rate of 2·2 per thousand inhabitants to 0·4 per thousand. The cholera epidemic which visited Hamburg in 1892, caused 8976 deaths, being at the rate of 134 per thousand in Hamburg, where the water supply was proved to be impure and to contain the cholera bacillus; while in Altona and Wandsbeck, adjoining the city, where the water was properly filtered before being supplied, the rate was respectively 23 and 22 per thousand.

This book, which is written for American students of sanitation, does not contain anything that is not known to sanitary engineers of this country. Naturally, in such a small compass it was not practicable to deal with any of the subjects treated in an exhaustive manner; nor can the work be regarded as a text-book, but rather as a well-written and able digest of matters which come within the range of the sanitary engineer.

La Cytologie Expérimentale. By A. Labbé. Pp. viii + 187. (Paris: Carré, 1898.)

THIS neat little book has the attractive form and style which characterises many French science manuals, and shares with them the defects inherent in any attempt to convey the difficult results of refined biological research in short paragraphs, even when written in the clearest of languages. At the same time we must add that it does not profess to be a complete text-book or treatise on the subject, and it is perhaps best described as a series of notes on some modern results of the study of the cell, by a zoologist. Artificial protoplasm and artificial karyokinetic figures are misleading terms to the beginner, and the scraps of information here gathered can be of little or no use to more advanced readers. The action of physical and chemical agents on the structure, metabolism, and movements of the cell seems curiously incomplete, in a French work, without reference to the yeast-plant; and although the notes on chemotaxis are interesting, they might have been rendered more valuable had the botanical side of the question been more fully dealt with. Indeed, throughout the work we notice a lack of appreciation of the work of plant-physiologists, *e.g.* as regards geotropic and heliotropic curvatures—no doubt inevitable where the author is a zoologist, the domain of each subject being now so wide that no one writer can deal adequately with both. Klebs' work on the effects of the environment in modifying the reproduction of algæ, for instance, is not mentioned.

The reciprocity between nucleus and cytoplasm; experimental modifications of cellular reproduction; adaptation to the environment; "tropisms and tactisms"; and cellular differentiation, are the other subjects dealt with.

While finding fault to the extent we have done, it is only fair to add that the subject-matter, so far as it is treated, is fascinating from every point of view, and many of the facts given are extremely interesting—*e.g.* those concerning the artificial separation of the nucleus from animal ova, those on "*cyto-symbiose*" and adaptation to parasitic life, those on intercellular connections, &c. Much more ought to have been said, we think, concerning the discoveries of botanists, especially in connection with the last two subjects.

The illustrations are numerous, well executed, and to the point; and praise must be accorded the glossary and the index to the bibliography, so far as it goes. Finally, we welcome this little book of notes, in the hope that it will be the forerunner of a more masterly treatise on an important and fascinating subject.

Studien über Hirsche (Gattung Cervus *im weitesten Sinne).* Heft I. Untersuchungen über mehrstangige Geweihe und die Morphologie der Hufthierhörner im Allgemeinen. By Dr. H. Nitsche. Pp. xi + 102. Plates xii. (Leipzig: W. Engelmann, 1898.)

WHETHER the work of which this first instalment is before us is intended to be a monograph of the *Cervidae*, or whether it is to be restricted to morphological considerations, future parts will decide. The present section deals solely with the morphology of antlers and their relations to the horns of other ruminants. In discussing antlers, most English zoologists of recognised position have confined their attention to normal examples. Not so Dr. Nitsche, who is apparently of opinion that the clue to the homology of the diverse structure of these appendages in different species is to be found in abnormalities, especially such as display a double or triple beam. Such abnormalities are classed under four types, in three of which the additional antler is more or less like the original form, while in the fourth the additional and normal portion together resemble an ordinary antler. Whether the result of these studies will have any important bearing on the classification of the *Cervidae*, cannot well be considered till the appearance of the later parts.

In the meanwhile attention may be directed to the author's very lucid account of the distinctions between the cranial appendages of the Pecora; such distinctions being admirably illustrated in Plate xii. To put it shortly, the author, in opposition to the view of M. Lataste, regards antlers as true outgrowths, or apophyses, from the frontal bones; these processes are at first covered with hairy integument, after the shrivelling-up and removal of which the exposed bare portion eventually falls off from necrosis at the base. In the following year the whole process of growth and shedding is repeated. On the other hand, in the remaining three families of the Pecora, to wit, *Giraffidae*, *Antilocapridae*, and *Bovidae*, the appendages originate as independent bony epiphyses, which become subsequently welded to the frontals. In the giraffe the horns, as these appendages should be called in all the members of the group, are clothed only with hairy skin. In the prongbuck a deciduous and forked horny sheath is superadded to the hairy skin. On the other hand, in the *Bovidae*, the hairy skin is lost, and the bony core is covered simply with a non-branched and non-deciduous horny sheath. The epiphysial origin of the horn-cores of the *Bovidae* is illustrated by a figure of the frontal region of a young chamois.

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These distinctions between antlers and the different types of horns are certainly the clearest and neatest that have come under our notice; and they naturally lead the author to the conclusion that the *Cervidae* form one group, and the other three families mentioned a second division of the Pecora. If his views obtain acceptation, they refute the late Prof. Garrod's theory of the near relationship of the musk-deer to the *Bovidae*.

Whether or no his predilection for abnormalities will bear any good fruit, the author has evidently devoted much pains-taking labour to the present fasciculus; and the issue of the remaining parts of the work will be awaited with interest. R. L.

Recent Advances in Astronomy. By A. H. Fison, D.Sc. Pp. vi + 237. (London: Blackie and Son, 1898.)

IN the course of half a dozen essays the author of this volume of the "Victorian Era Series" has attempted to give an account of a few of the more interesting problems of modern astronomy. While the book is admirably written throughout, the subject-matter is in some respects not sufficiently up to date. For example, in the essay on the "life of a star," which is otherwise exceedingly interesting, there is practically no reference to the spectroscopic evidence bearing on the subject; and again, in that on the "analysis of starlight," there is no account of the different kinds of stellar spectra and their probable relationship to each other, most of this chapter being concerned with motion in the line of sight.

One of the best essays is that on Mars, which summarises what we know of that planet, as well as the various speculations to which such knowledge has led.

The book is notably free from errors for a first edition; but we may point out that the discovery of carbon in the sun was not made in 1887, as stated on p. 187, but was announced by another investigator altogether in 1878.

It is unfortunate that, either for want of time or opportunity, the author has not gained a closer acquaintance with recent spectroscopic investigations. Had he done so, his book would have been much improved. Nevertheless, the selected subjects are treated in an able manner, and the book deserves to be widely read.

Among the Celestials. By Captain Francis Younghusband, C.I.E. Pp. 261. (London: John Murray, 1898.)

THE inspiring volume entitled "The Heart of a Continent," in which Captain Younghusband gave a straightforward record of ten years' travel in Manchuria, across the Gobi Desert, through the Himalayas, the Pamirs, and Chitral to India, was reviewed at length in these columns in 1896 (vol. liv. p. 130). The present volume has been abridged from the original work, by omitting geographical details which, though of service to geographers and travellers, are not of interest to the general public. The previous book will be published in two parts. The first part, now before us, deals with Captain Younghusband's travels in the Chinese Empire, a chapter on the outlook in Manchuria being added. The second part will describe experiences and impressions obtained during travels in the borderland between British and Russian territory in Central Asia.

There should be many readers for Captain Younghusband's interesting narrative in the form it is now presented.

A Cotswold Village: or, Country Life and Pursuits in Gloucestershire. By J. Arthur Gibbs. Pp. xvi + 431. (London: John Murray, 1898.)

FIELD naturalists, and all other admirers of natural life and scenes, will read this volume with pleasure. The book is of the gossipy kind, and village characters and customs figure prominently in it; but many keen observations are recorded, and the descriptions of pastoral scenes will delight all who love the country.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Production of Magnetisation by Circularly Polarised Light.

IN NATURE for January 5, Prof. Fitzgerald points out that a beam of circularly polarised light sent through a substance absorbent in consequence of syntony with the vibration ought to produce magnetisation of the substance. The result of the experiments he has set on foot will be awaited with much interest.

In the *Proceedings* of the Royal Society for February 17 of last year Prof. Fitzgerald pointed out also that the Zeeman and Faraday effects are related phenomena. I may mention that in the *Phil. Mag.* for December 1890, I gave a very slight sketch of experiments I had carried out from time to time during several years previously, with the view of discovering the effect which theory had seemed to me to prove ought to be produced by the passage of circularly polarised light through a medium showing the Faraday effect. I have made many experiments of this kind with a bar of Faraday's heavy glass, looking for the production and disappearance of a magnetic field (with the excitation and quenching of the beam) by means of an induction coil wrapped round the bar. Calculation shows that the effect in such a case should be very small—so small as perhaps to be quite inappreciable. The investigation is, however, being resumed with improved apparatus and arrangements which I hope may not be entirely without result.

ANDREW GRAY.

Magnetic Perturbations of the Spectral Lines.—Further Resolution of the Quartet.

FOR some time past I have been in hope that, with the strong magnetic field now at my disposal in the Physical Laboratory of the Royal University of Ireland, I might perhaps be able to effect some further resolution of the spectral lines. For example, in the case of a line which is converted into a triplet (normal type) by a magnetic field of strength 20,000, or thereabouts, it is possible that each constituent of this triplet may become further resolved into a doublet, or a triplet, when the strength of the field is increased to 40,000 or 50,000 C.G.S. units.

Although I cannot yet affirm that the normal triplet becomes further resolved in very intense fields (but symptoms of a further resolution into doublets are sometimes seen), yet, on the other hand, it has been placed beyond all doubt that the "quartet" form becomes further resolved when the strength of the field is increased.

The quartet form, it will be remembered, consists of two strong side lines with two fainter lines between them—the latter pair corresponding to the middle line of the normal triplet. When the strength of the magnetic field is gradually increased, the side lines begin to separate into pairs; and ultimately, what was at first a quartet stand forth as a sextet of well-defined sharp lines. We may take it, therefore, that the quartet form has ceased to exist as a distinct type, except for this one peculiarity, viz. that in it the separation of the middle pair is considerably greater than that of the side pairs.[1] The exact ratio of these separations I have not yet determined with precision, but I hope to give measurements on this and some other matters at an early date.

It is not to be understood that this further resolution raises any new difficulties in the way of theoretical explanation, for, as I have already pointed out (*Phil. Mag.*, February 1899), the purely precessional perturbation of the orbit which gives rise to tripling pure and simple is by no means likely to be unaccompanied by other subsidiary perturbations of more or less intensity, such as oscillations of the plane of the orbit, apsidal motions, and so on, and such perturbations as these explain the existence of types other than the normal triplet. In fact, things appear very much more natural, as well as more interesting, now that we know that the triplet pure and simple is likely to become the exception rather than the rule.

THOMAS PRESTON.

Dublin, February 9.

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[1] On the contrary, D_2 is a sextet of *equally spaced* lines.

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